

**ABSTRACT OF THE DISCLOSURE**

A system and method for co-production of hydrogen and electrical energy. The system comprises a fuel cell assembly comprising a plurality of fuel cells. The fuel cells further comprise a cathode inlet for receiving a compressed oxidant, an anode inlet for receiving a fuel feed stream, an anode outlet in fluid communication with an anode exhaust stream and a cathode outlet in fluid communication with a cathode exhaust stream. At least a portion of the fuel feed stream reacts with the oxidant to produce electrical power. The anode exhaust stream comprises hydrogen. The co-production system further comprises a separation unit in fluid communication with the fuel cell assembly. The separation unit is configured to receive the anode exhaust stream from the fuel cell assembly to separate hydrogen from the anode exhaust stream.